

## **REMARKS/ARGUMENTS**

Claims 21 - 26 remain in the application.

Original claims 1 -20 and 27 – 33 have been canceled.

Claims 21 – 26 were rejected under 35 USC §103(a) as being unpatentable over US Patent No. 6,397,752 to W. Yang et al in view of US Patent NO. 5,431,104 to J.M. Barker.

### **Brief Review of the Invention**

Applicant's **claimed** invention (claim 21) is directed to an apparatus for severing a length of pipe comprising several essential characteristics:

- (1) a tubular housing having a barrel space having a **column of explosive** between a resiliently biased detonator housing and a selectively removable end plug;
- (2) a first electric detonator positioned in the detonator housing to resiliently **bear upon one end** of the explosive column;
- (3) a second electric detonator positioned in the end plug to **bear upon the other end** of the explosive column;
- (4) a capacitive firing cartridge within the tubular housing; and,
- (5) electrical conduits between the capacitive firing cartridge and the electric detonators that need not be disconnected when the end plug is detached from the tubular housing for inserting or extracting the explosive column.

There are several unobvious advantages to the synergistic combination described by Applicant's amended claim 21, one of which is found in Applicant's specification ¶ [0023].

"An unusually high voltage surge is required to detonate the EBW detonator (or EFI).... The system is relatively impervious to static discharges, stray electrical fields and radio frequency emissions".

Other unobvious advantages to the combination are described in specification

¶ [0026] and [0027].

“it is a design intent for the invention to obviate the need for field connections. Without explosive pellet material in the outer housing bore 14, EBW detonators 32 and 66 are the only explosive material in the assembly..... Consequently, without explosive material in the tubing bore 14, the assembly as illustrated by FIG. 1 is safe for transport with the EBW detonators 32 and 66 connected in place.

The significance of having a severing tool that requires no detonator connections at the well site for arming cannot be minimized.”

These characteristics of Applicant's invention permit the cutter housing to be constructed and primed prior to transport from a remote assembly plant. The only electrical connection that must be made at the well site is to the wire-line conductor.

The explosive column of Applicant's invention is an assembly of numerous, small value, explosive pellets of compressed explosive material formed in the shape of a thin disc having a central aperture. Due to the small explosive value of each disc, one or a few discs may be safely transported as separate packages. At or near the well site, a precisely prescribed number of the pellets may be structurally combined as a singular unit prior to combination with the pre-primed housing. This structural combination of pellets is accomplished by inserting a rod through the central aperture of each pellet to form a serially accumulated column of explosive pellets along the rod length. The pellet column construction is performed independently of the housing for an absolute visual verification that the correct explosive value and alignment relationship between the pellets is assembled. Notably, the assembled column of high explosive pellets has no proximate detonation means until actual and final insertion into the housing barrel.

Both ends of the tubular enclosure for the pellet assembly are environmentally sealed. However, one end is sealed by a conveniently removed cap that contains an electrical detonator (66). When an explosive pellet column occupies the internal space of the tubular enclosure and the removable end cap is in place, the electrical detonator (66) engages the adjacent end of the explosive pellet column.

The internal opposite end of the tubular enclosure houses a capacitive firing cartridge (26) and a spring biased “detonator housing” (28). This “detonator housing”

is a floating plug that carries a second electrical detonator (32) in such a manner as to engage the “opposite” end of the explosive pellet column. The bias orientation of the spring against the detonator housing is to compress the explosive pellet column between the two electrical detonators (32) and (66).

Advantageously, Applicant’s invention first provides **assured detonation** of the explosive column at both ends **simultaneously**. Secondly, all of the internal electrical connections for the electrical detonators (32) and (66) to the capacitive firing cartridge (26) within the tubular enclosure are completed before the explosive pellet column is inserted in the tube housing. These connections may be made in a location remote from the use location thereby enabling an “armed” but non-explosively charged long-distance transport of the cutter housing.

### **The Yang et al Reference**

The **Yang et al** patent discloses an assembly interface between two well perforating guns. A plurality of shaped charges in each “gun carrier” (18A or B) are detonated non-electrically by a serially progressing pyrotechnic detonation cord. A “detonation wave” is transmitted along a first detonating cord (130) in a first gun to a second detonating cord (136) in a second gun (18B) across an assembly gap (144) between a donor booster 132 in the first “carrier” (18A) and a receptor booster (134) in the second “carrier” (18B). There are no electrically actuated detonators in the Yang et al disclosure as described by applicant’s claim 21.

### **The Barker Reference**

**Barker** describes an electrically actuated exploding foil initiator for detonating perforating gun assemblies and a cooperative capacitive discharge firing unit for actuating the initiator.

### **Argument**

The Examiner’s explanation of Yang et al does not reveal what element of the Yang et al **perforating gun** is translated to be a “column of explosive material” as

described by Applicant's claim 21. A "perforating gun" is not "[A]n apparatus for severing a length of pipe". One objective distinction between a perforating gun and Applicant's pipe cutter is "a" (singular) column of explosive having detonators that "**bear upon**" opposite ends of the column. Such an organization of elements is deemed essential for producing a pressure wave collision at the center of the explosive column that results in a jet of hot gas radiating as a pipe cutting disc from the explosive column axis.

There may be many definitions of the phrase "bear upon" but **all**, by any construction, must describe an effective influence on a subject. Applicant finds no construction of the Yang et al patent that justifies an interpretation of a column of explosive having detonators at opposite ends of the column: in particular, an interpretation of opposite end detonators having an effective influence on such a constructive explosive column. Note should be taken of the context in which "bear upon" is used in these apparatus claims. Here, the phrase is used as a structural description of position relative to the explosive column.

Distilled to its bare essence, Applicant's independent claim 21 describes a "column of explosive" having electrical detonators bearing upon opposite ends of the column. One of the detonators may be selectively removed without disconnection from a mutual capacitive firing cartridge.

Since the Yang et al patent is for a perforating gun and not a pipe cutter, Yang et al does not disclose a "column of explosive material" having detonators of any kind bearing upon an explosive column. Applicant is left to speculate over the element or elements of Yang et al that have been construed to be a "column of explosive material". The Yang et al detonation cord 130 or 136 is not an "explosive material". None of the Yang et al shaped charges have detonators bearing upon opposite ends. A constructive Yang et al "column" comprising a plurality of shaped charges has no detonators bearing upon opposite ends of such a "column". There may be detonators at opposite ends of a Yang et al charge carrier 18 but only one has any bearing upon the collective assembly of shaped charges.

Aside from a utilitarian reference to "perforating gun assemblies", Barker includes no additional application description. Hence, the only combination relevance

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an exploding foil initiator taught by Barker could have to the Yang et al patent would be as a substitute for the Yang et al "donor" booster explosive 132. Of course, if such a substitution was made, the "receptor" booster explosive 134 would be superfluous as having no function. The next electrically actuated "donor" booster 132 could not be ignited by a "receptor" booster mechanism. Hence all of the "donor" boosters would need to be electrically initiated and there would be no "receptor" booster.

Applicant's dependent claim 22 specifies the "column of explosive" appearing in claim 21 as "unitized about a substantially central rod structure having a length greater than said axial column of explosive." The Examiner's rejection analysis includes no mention of the claim 22 rod structure. Certainly, the "perforating gun" of Yang et al has no use for a "central rod structure." Similarly, neither the rejection analysis nor the prior art of Yang et al or Barker has any relevance to the structure of Applicant's dependent claims 24 – 26. By what rationale could claimed structure that is totally absent from the prior art be also "obvious" from the prior art?

Respectfully, the 35 USC §103(a) rejection of claims 21 – 26 as unpatentable over Yang et al in view of Barker is traversed as unsustainable in fact or law.

### **Conclusion**

In view of the foregoing remarks, Applicant respectfully requests the Examiner's favorable reconsideration and allowance of claims 21 - 26 as patentably novel over the prior art.

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Respectfully Submitted,

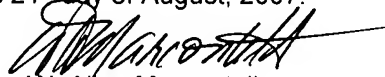


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